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Water stewardship in Finnish corporations – developing a toolbox for value chain management

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Abstract

Water is a significant resource for the nature, for people and for corporations. Corporate operations require water in many different steps if not in all of them. The largest amount of water is used in corporate value chains. Corporate water stewardship promotes sustainable use of water both in internal and external operations of a corporation. Value chains are recognised as the biggest challenge for corporate water stewardship. This study aimed to identify 1) the biggest challenges Finnish corporations have with water stewardship, 2) how water stewardship is managed in the value chains and 3) which tools could be used to improve value chain management

To achieve these aims, corporate and expert interviews and literature review of water stewardship and value chain management were conducted. Data was analysed through analytical framework that was established for this study. Analytical framework was built with the water reporting framework of CDP Water Program and value chain management theories.

The results show that corporations have quite consistent challenges with water stewardship. At the same, it was possible to identify several tools in use for value chain management. The biggest challenges considered the lack of information on value chains and water use in them and a difficulty to take water stewardship beyond internal actions of a corporation to external actions. Additionally, climate actions have taken a big part of corporations' sustainability work. Based on these findings, a toolbox that provides tools for water sustainable value chain management, was built. Toolbox includes six categories, which are 1) legislation and policy, 2) contracts, 3) strategy, 4) resource efficiency, 5) communication and information sharing, and 6) stakeholder engagement. The toolbox aims to ease the consideration of water stewardship as part of value chain management by creating a coherent entity of several different management tools.

Keywords Water stewardship, Value chain management, Corporations, Sustainability

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Tiivistelmä

Vesi on merkittävä resurssi luonnolle, ihmisille ja yritysten toiminnalle. Yritysten toimintaan tarvitaan vettä kaikissa sen vaiheissa ja suurin osuus vedestä käytetäänkin yritysten arvoketjuissa. Yritysten vesivastuu edistää kestävää vedenkäyttöä sekä yrityksen sisäisissä toimissa että arvoketjussa. Merkittävimmäksi haasteeksi on tunnistettu juuri arvoketjut. Tämän diplomityön tavoitteena oli 1) tunnistaa suomalaisten yritysten suurimmat haasteet vesivastuussa, 2) tunnistaa yritysten keinot vesivastuun hallintaan arvoketjuissa ja 3) löytää keinoja, joilla arvoketjujen hallintaa voidaan vesivastuun osalta parantaa.

Näiden tavoitteiden saavuttamiseksi tehtiin yrityshaastatteluja, asiantuntijahaastatteluja sekä kirjallisuuskatsaus vesivastuu -ja arvoketjukirjallisuudesta. Työtä varten rakennettiin analyyttinen viitekehys, jonka kautta kerättyä aineistoa analysoitiin. Analyyttinen viitekehys rakentui CDP Water Program:n vesiraportoinnin pohjasta ja arvoketjujen hallinnan osa-alueista.

Tulokset osoittivat yhteneväisiä vesivastuuhaasteita yritysten välillä ja toisaalta tunnistettavissa oli useita työkaluja, joita yritykset käyttävät arvoketjujensa hallintaan. Suurimmat haasteet liittyivät tiedon vähäisyyteen arvoketjuista ja niiden vedenkäytöstä sekä vaikeuteen viedä vesivastuutoimia yrityksen omien toimintojen ulkopuolelle. Lisäksi ilmastotoimet vievät ison osan vastuullisuustyön resursseista, eikä vesivastuulla ole vielä yhtä suurta painoarvoa. Näiden löydösten perusteella rakentui työkalupakki, joka tarjoaa eri kategorioihin perustuvia keinoja vesivastuulliseen arvoketjun hallintaan. Kategorioiksi muodostui 1) lainsäädäntö ja politiikka, 2) sopimukset, 3) strategia, 4) resurssitehokkuus, 5) kommunikaatio ja informaation jakaminen ja 6) sidosryhmäyhteistyö. Työkalupakin tarkoituksena on luoda erilaisista hallinnan keinoista yhtenäinen kokonaisuus, joka helpottaa vesivastuun huomioimista arvoketjujen hallinnassa.

Avainsanat Vesivastuu, Arvoketjujen hallinta, Yritykset, Kestävyys

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Once, a clever woman said to me that if I want to combine natural sciences and development issues, I should study water. Few years later I enrolled to a master program of water and environmental engineering. So, thank you Roseanna for your helpful advice that has brought me to this point. Past two years have taught me a lot and I have learned skills that I would not have learned in any other place. However, I am still searching my inner engineer.

My thesis topic was invented by an accident. I stumbled on this concept of corporate water stewardship and got excited immediately. It sounded something I would really like to do my master's thesis about. I also thought that this topic would be suitable for me because of its multidisciplinary nature. I was lucky to notice that Ph.D. Suvi Sojamo from Aalto University coordinated Finnish Water Stewardship Commitment and later promised to act as my advisor.

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Abbreviations

AWS = Alliance for Water Stewardship
BAFWAC = Business Alliance for Water and Climate
BSAG = Baltic Sea Action Group
CBWT = Context based water targets
CSR = Corporate social responsibility
EWS = European Water Stewardship
FSC= Forest stewardship council
GHG= Greenhouse gases
KPI = Key performance indicator
PEFC = Programme for the endorsement of forest certification
SCM = Supply chain management
SCO = Supply chain orientation
SME = Small and medium-sized enterprises
WHO = World Health Organization
WWF = World Wildlife Fund

1 Introduction

Water is essential part of human life and business activities. Water and sanitation are recognized as human right by the United Nations but still 1.6 billion people live in countries that are lacking infrastructure for water supply and 1.2 billion people face physical water scarcity (WHO and Unicef, 2017). Historically water was considered as an essentially free and abundant resource but now it is understood as a critical resource to business and economic growth (Sarni and Grant, 2018). 70% of global freshwater is used and polluted by companies in different sectors (CDP Water, 2018). Water demand is growing globally due to climate change, population growth and change of lifestyles while availability of freshwater resources is declining (IUCN, 2018, Rozza et al., 2013, IPCC, 2007).

Water footprint of corporate value chains is usually bigger than water footprint of corporations' own activities (WWF Finland, 2012). Due to a local nature of water resources water footprint must be connected to a context (Hoekstra et al. 2011). Because of this, total increase of water use efficiency in the value chain does not necessarily mean that positive impacts take place in the most sensitive areas (Jones et al., 2015). Additionally, possibilities to increase water use in many geographies is uncertain (Rozza et al., 2013).

Through the value chains of business water does not only have a local value but global characters as well (Hoekstra et al., 2015). Import of water-intensive commodities has a possibility to reduce the pressure for local water resources while water use for producing export commodities can increase water scarcities in vulnerable areas (Hoekstra et al., 2015).

In a global world, corporations are more and more dependent on their value chains and suppliers (Mangan and Lalwani, 2016). Sustainability of the communities and watersheds where a corporation operates, defines the sustainability of the corporation itself (Rozza et al., 2013). Corporations' responsibility of their global value chains has received much attention lately in Finland and globally (De Chiara and Russo Spena, 2011 & Helsingin Sanomat 2019). Rising discussion considers all the different aspects of responsibility, including social, economic and environmental aspects. Corporate social responsibility (CSR) refers to firstly, relationship with corporation and larger society and secondly to corporations' volunteer activities regarding environment and social issues (Andersen and Skjoett-Larsen, 2009).Yet, there is no common understanding or definition what CSR means or how it should be integrated into corporation strategies (Eranda and Abeysekera, 2015). CSR considers economic, environmental and social responsibilities or sustainability of corporations. At a general level CSR means actions and practices of corporation that are beneficial and add value for the corporation but also for the society (Eranda and Abeysekera, 2015). While CSR is voluntary addition to corporations' strategies no laws are regulating how extensive responsibility practices should be and to which extend corporations are responsible of human right violations or other offences (Newborne and Dalton, 2016).

Corporate social responsibility does not specify how corporations should take notice of different parts of it. Value chain management is a rather new thing in CSR, but corporations are extending CSR concept also to value chains (Mares, 2010, Caplan et al., 2013) . Most commonly focus has been on labor rights, child labor but also on environmental issues (Mares, 2010). Most norms of CSR discuss mostly about human rights and labor conditions.

Water stewardship supports sustainable development and sustainable water use of corporations. It goes beyond corporations' own activities to value chains. Rising number of corporations are endorsing water stewardship activities (CDP Water, 2018). Initiatives like CEO Water mandate and Business Alliance for Water and Climate (BAFWAC) as well as Finnish Water Stewardship commitment provide key guidelines for corporate water stewardship including International Water Stewardship Standard by Alliance for Water Stewardship. Water stewardship is still mainly based on voluntary will of corporations and only few companies have systemically applied it to their operations or certified offices and factories.

According to a CDP water report (2018), companies reported water-related financial losses of 38.5 billion US$, which is more than losses in previous years. While corporations have given more attention to sustainable water management and establishing water strategies, water withdrawals have increased (CDP Water, 2018). Drivers for water stewardship are e.g.; disruption of operations, partnership development, improved efficiency in water use, public acceptance of business, balancing risk and economic performance and communication with stakeholders (Newborne and Dalton, 2016, Sengupta, 2017).

While corporations are taking steps towards more sustainable water use and management, they are lacking practical tools for their value chain management regarding water stewardship. Complexity of value chains hinders transparency and traceability.

This master's thesis combines corporate water stewardship and value chain management. Corporate water stewardship and the need for extending it to value chains has been outlined by water stewardship initiatives (WWF, 2018, AWS, 2019, CEO Water Mandate et al., 2013). Yet, corporations have not implemented it in practice (Newborne and Dalton, 2016). The thesis acquires concepts from value chain management and links them with steps of corporate water stewardship. Value chain management is already embedded in corporate world and the concepts that would be beneficial and go along with water stewardship context are selected and presented in an analytical framework constructed for the purpose of this thesis.

Research aim of this thesis was to identify the biggest challenges Finnish corporations have with water stewardship, how water stewardship is managed in the value chains and which tools could be used to improve value chain management.

Research objectives were:

1) **Testing the analytical framework constructed for this thesis**
2) **Developing a toolbox for value chain management considering water stewardship**

To support these objectives, two set of research questions were developed:

1) **What are the challenges corporations face regarding water stewardship in their value chains? How do they tackle these challenges?**

2) **How is water stewardship managed across corporate value chains and what kind of tools could be used for the management?**

This thesis is structured as follows; Firstly, research context including theories of corporate water stewardship and value chains is set. Secondly, analytical framework and its background is presented. Then, main materials and methods are described. In the results section, results from corporate interviews and document analysis are presented. Results are followed by discussion and conclusions.

2 Research context

2.1 Corporate water stewardship

According to WWF definition water stewardship for business is:

> "*a progression of increased improvement of water use and a reduction in the water-related impacts of internal and value chain operations. More importantly, it is a commitment to the sustainable management of shared water resources in the public interest through collective action with other businesses, governments, NGOs and communities."* (WWF, 2013).

Alliance for Water Stewardship (AWS) defines corporate water stewardship as follows:

> "*the use of water that is socially and culturally equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site-and catchment-based actions*."(AWS, 2019).

Corporate water stewardship does not only define water risks and mitigation inside the corporation but in an extensive context by urging sustainable management and governance of water across the whole value chain of corporation. This means that water-related actions must be taken to a next level, to up-stream of the value chain. This is the most critical step of the water stewardship process (Newborne and Dalton, 2016). External actions include community engagement and influencing larger governance structures, meaning national and international governance (WWF, 2018). One way to distinguish internal and external corporate actions is to consider internal actions as water management and the whole process as water stewardship (Newborne and Dalton, 2016).

The first step in corporate water stewardship is water risk assessment and identification of the hotspots where special focus on water issues is needed (Water Stewardship 101, 2019; WWF, 2018, Finnish Water Stewardship Commitment). This establishes a baseline for coming steps: target setting and integrating water stewardship to corporate strategy. Developing sustainable water management practices internally and with value chain stakeholders is also crucial for realization of water stewardship. Furthermore, monitoring, auditing and reporting are part of water stewardship. Water stewardship cannot be conducted without engagement of value chain and collective action. Value chain engagement is important because the water footprint of value chain is usually bigger than water footprint of corporation's own operations (WWF Finland, 2012). Engagement could include activities such as engaging local communities, awareness raising or education (CEO Water Mandate et al., 2013, Rozza et al., 2013).

Value chains are specific for each industrial sector which requires sector specific water-related targets (Rozza et al., 2013). Often corporations are focused on improving water use

efficiency and reducing water pollution but not yet focused on the root causes of water challenges (CEO Water Mandate et al., 2017). Water dependency of corporations varies between industries. Economic activities can be divided to three sectors; primary, secondary and tertiary activities. Primary sector has the biggest water footprint of all these sectors. (Hoekstra et al., 2015).

Industries as food and beverage are directly dependent on water and the connection is clear. Connection can be also indirect when dependency comes through value chain. However, corporations still lack knowledge about connection in wider perspective e.g. how corporate actions impact on nature, communities and other companies (CEO Water Mandate et al., 2017). Water stewardship aims to more strategic approach to responsible water management that goes beyond philanthropic projects and leads to collective action (Newborne and Dalton, 2016). Furthermore, many corporations have usually activities at the same basin area, so water needs are collective and shared with other corporations, nature and communities, thus engagement for a more consistent approach is needed (CEO Water Mandate et al., 2017). Water as a resource is always local and so are the impacts of water consumption and pollution in the basin where they occur (CEO Water Mandate et al., 2017). For this purpose, understanding local conditions is crucial.

Water stewardship requires collaboration between different stakeholders at the basin level. As outlined by WWF, water stewardship is a next step after water management and answering to local challenges at the basin level is the crucial point which separate water stewardship from water management (WWF, 2018, Newborne and Dalton, 2016). Local or national governments are usually responsible of water resource management and combining corporate water targets to governmental policy goals is needed. Collaborating with local stakeholders and engaging them to water targets of a corporation can provide benefits for corporation and business. (CEO Water Mandate et al., 2017). Context-based Water Targets CBWT approach eases understanding of multi-issue nature of water and linkages to the water-food-energy-ecosystem nexus at the basin level (CEO Water Mandate et al., 2019).

In the following sections, different aspects of corporate water stewardship are presented. These sections are based on CDP water reporting framework (Figure 1). The thesis follows the titles of reporting framework but does not fully follow the specified questions presented in Figure 1. The CDP reporting framework was selected because there are quite many companies (296 in 2018) who report through CDP and the framework is supportive to frameworks of corporate water stewardship initiatives such as CEO Water Mandate, WWF, Alliance for Water Stewardship and European Water Stewardship.

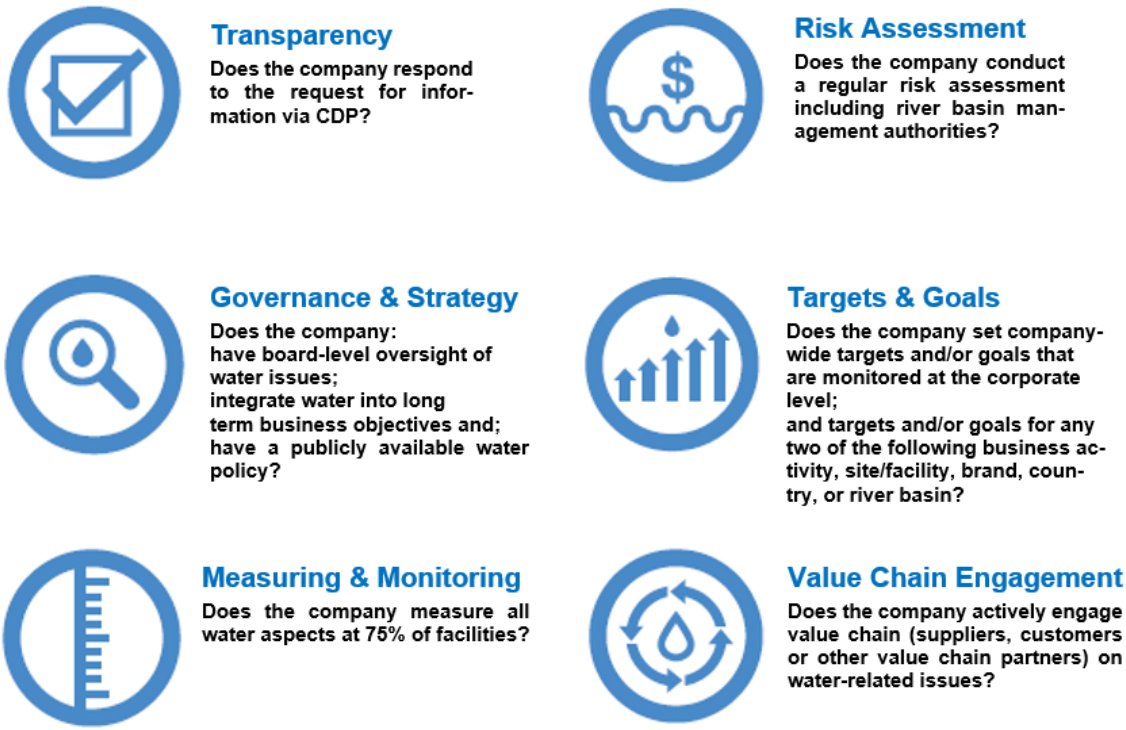

Figure 1. CDP Water reporting framework (CDP Water 2018).

2.1.1 Risk assessment

In order to improve water management and water stewardship companies must be aware of their water related risks (WWF, 2018). This refers to water risks of companies' own operation and water risks occurring within the value chain. This is especially important when value chains run to countries suffering water scarcity. Risks assessment gives an ability to prioritise risks and build the next approach, water strategy, based on the risk assessment. Water risk assessment is usually the first step towards water stewardship.

Water risks have been world's most concerning risks for years and in 2018 water risks were the fourth biggest risk in terms of impact (World Economic Forum, 2019). Water risk refers to possibility to undergo a water-related challenge (e.g. flooding, drought, water scarcity, water stress, etc)" (CEO Water Mandate, 2014)

Water risks can be categorized into three section (CEO Water Mandate, 2014)

Physical – Having too little water, too much water, water that is unfit for use, or inaccessible water

Regulatory – Changing, ineffective, or poorly-implemented public water policy and/or regulations

Reputational – Stakeholder perceptions that a company does not conduct business in a sustainable or responsible fashion with respect to water.

"Water risk for businesses" is also sometimes divided into two categories based on a source of a risk (CEO Water Mandate, 2014 p, 5):

"Risk due to company operations, products, and services – A measure of the severity and likelihood of water challenges derived from the way in which a company or organization, and the suppliers from which it sources goods, operate and how its products and services affect people and ecosystems.
Risk due to basin conditions – A measure of the severity and likelihood of water challenges derived from the watershed/basin context in which a company or organization and/or its suppliers from which it sources goods operate, which cannot be addressed through changes in its operations or its suppliers and requires engagement outside the fence."

Corporations are usually aware of water risks of their own operations but not in the value chains (Newborne and Dalton, 2016). Water-related risks are specific for each business depending on the field they work (Rozza et al., 2013). Risk assessments are a significant part of business decisions and e.g. 62 % of corporations reporting through CDP conduct also water risk assessments (Mangan and Lalwani 2018 p.144-165, CDP Water, 2018). Corporations, especially leading corporations, are becoming more aware of their water risks and corporations see water risks as part of business risks (Newborne and Mason, 2012). Water risk assessment tools such as WWF Water Risk Filter, WRI Aqueduct and WBCSD Water Tools could be used for water risk assessment. However, prior risk assessment corporations must have knowledge of their value chains and areas where their resources are coming from.

2.1.2 Governance and strategy

Governance and strategy are used in the thesis to explain both water governance and strategy but also corporate governance and strategy in a broader view which includes legislation, contracts and voluntary approaches to responsibility questions. Corporate water governance refers to strategic decision discussed in a board-level to promote water stewardship. (CDP, 2018). 40% of companies who report through CDP, have integrated water into governance and strategies (CDP Water, 2018). Water strategy and governance enable the big step from internal actions to external actions (Newborne and Dalton, 2016).

Corporate water stewardship is based on the voluntary will of companies to improve their water management and reduce adverse water related effects. In the advanced level, the objective of water stewardship is to influence to higher level and focus also on the corporate governance and motivate public governance to pay more attention to water-related issues (WWF, 2018).

While most of the responsibility of governing and managing freshwater resources lies on the public governance of the catchment area, some catchments are not governed in sustainable manner (Newborne, 2011). This so called "governance gap" is challenging but cannot be fulfilled only with corporate water stewardship. Collaboration between stakeholders is crucial.

Corporations must follow legislation of countries where they operate (Newborne, 2011). Company constitution and company laws are defined in a country where corporation is registered. When company operates in other countries it must follow local legislation, e.g. environmental legislation, this goes also for outsourced companies. Company law and company constitution define the purpose and the responsibility of corporations (Newborne and

Mason, 2012). Furthermore, company laws set the normative framework for private sector institutions together with stock market codes when these are applicable (Newborne and Mason, 2012).

Corporate strategy refers to the scope and direction of a corporation to make decisions that support achieving the best interest of a firm as a whole (Grant et al., 2017, p. 271). Water strategy outlines the approach to improved water management and stewardship. It should be integrated into an overall strategy of corporations (Newborne and Dalton, 2016). This directs all the water stewardship activities in the corporation. Water strategy of an organization defines mission and vision towards good water stewardship and includes supportive goals for the mission (AWS, 2019). Aivazidou et al. (2016) introduced a framework for decision-making process in agribusiness industries with strategic, tactical and operational approaches which utilizes water footprint concept as a key performance indicator (KPI) (Table 1). Different management decisions have effects on different processes in value chain.

Effective and comprehensive water strategy planning and implementation needs stakeholders from different parts of value chain (CEO Water Mandate et al., 2017). Because of diversity of industries each sector should have the targets that are suitable for that sector. Thus, engagement and cooperation are important here as well. Initiatives like CEO water mandate and Ceres Aqua Gauge have established guidelines for target setting (CEO Water Mandate et al., 2019).

WWF has outlined the importance of influencing governments to improve weak water governance and management (WWF, 2018). While corporations have power to make a difference in value chains by using contract-based tools the usually do not have power to influence other water using corporations or stakeholders in the area (Newborne and Mason, 2012).

Table 1. Hierarchical decision-making framework (Aivazidou et al. 2016)

Hierarchical level	Water footprint management decision	Supply chain echelon		
		Cultivation/ Procurement	Processing/ Manufacturing	Packaging
Strategic	Cultivation of crops requiring less water	•		
	Alteration of conventional crops into organic crops	•		
	Selection and collaboration with water-friendly partners		•	
	Establishment of water auditing and control systems		•	
	Investment in water-efficient technologies		•	•
	Campaigns for raising consumer awareness			
Tactical	Use of precision techniques of irrigation and agriculture	•		
	Enhancement of water retention in the soil	•		
	Change in product composition		•	
	Reuse and recycling of wastewater		•	•
	Establishment of environmental labelling			
Operational	Prudent use of pesticides and fertilizers	•		
	Prudent use of toxic chemical substances		•	•
	Use of water-efficient packaging			•
	Prudent use of biofuels in transport			
	Reduction of food waste	•	•	

		Transportation	Retailing	Consumption/ Consumer use	Waste management
Strategic	Cultivation of crops requiring less water				
	Alteration of conventional crops into organic crops				
	Selection and collaboration with water-friendly partners		•		
	Establishment of water auditing and control systems		•		
	Investment in water-efficient technologies		•		•
	Campaigns for raising consumer awareness		•	•	
Tactical	Use of precision techniques of irrigation and agriculture				
	Enhancement of water retention in the soil				
	Change in product composition				
	Reuse and recycling of wastewater				
	Establishment of environmental labelling		•		
Operational	Prudent use of pesticides and fertilizers				
	Prudent use of toxic chemical substances				•
	Use of water-efficient packaging				
	Prudent use of biofuels in transport	•			
	Reduction of food waste	•	•		

Companies have a freedom of contracts which means that companies can decide without restraint to whom they want to make a contract with and freedom to choose content of contracts (Hoppu and Hoppu, 2012). However, there are some restrictions for freedom of contracts, e.g. for companies that have a monopoly position. Certificates and standards can be supportive tools for contracts. Corporations can decide (within the law) which standards and certificates they use (Grant et al., 2017). Global Reporting Initiative (GRI) added a new standard in 2018 under the standard 300: Environmental topics. The New standard 303: Water and Effluents helps corporations to understand their water-related impacts and reporting them as part of their sustainability report (GRI 303). AWS, EWS standards and ISO water footprint standard 14046 focus especially on water in extensive way including also the value chain aspect (ISO 14046:2014, AWS 2019, EWS 2012).

2.1.3 Targets & Goals

Water stewardship targets and goals are used for supporting the implementation of water strategy in practice. Targets and goals can consider wastewater quality, water use efficiency or using resources that are more water responsible. Only few companies (29%) who report through CDP have set targets/ goals of water stewardship or water reductions (CDP Water, 2018). Corporations are focused on water use efficiency and reducing the water use per production unit (Jones et al., 2014). Focusing on water use reductions and water efficiency is not appropriate or effective in all contexts. Water withdrawals might still increase due to increased production. (Newborne and Dalton, 2016).

Context-based water targets that support water stewardship within the whole value chain are the most effective (CEO Water Mandate et al., 2017). SDG 6 targets can work as a guidance for private sector as well while addressed for public sector (UN-Water, 2016). Context-based water target setting aims to strengthen the contribution of private sector to collective actions that respect water basin boundaries (CEO Water Mandate et al., 2017).

Furthermore, site-specific water targets emphasize three elements in target setting: 1) water targets should respond to priority water challenges within the catchment, 2) the ambition of water targets should be informed by the site's contribution to water challenges and desired conditions, 3) Water targets should reduce water risk, capitalize on opportunities and contribute to public policy priorities (CEO Water Mandate et al., 2019). Data availability is one severe constraint on the water stewardship target setting and monitoring (Newborne and Mason, 2012).

2.1.4 Measuring & monitoring

Usually water related measuring and monitoring is based on environmental permits which regulate the nutrient content of effluent and water withdrawals among many other things (YSL 527/2014). 59 % of companies who report through CDP monitor water aspects (CDP Water, 2018). Environmental permits of facilities define how much they can discharge water to the environment and what should be the quality of wastewaters (YSL 527/2014). Alternatively, company must follow the legislation of a country in which it is working.

AWS has included indirect water use identification and water embedded in the production of primary materials into the criteria of their standard (AWS, 2019). Corporations should ensure that their suppliers have strong measuring and monitoring systems (CDP Water, 2018). This requires identification of embedded water use in primary inputs and in outsourced activities. AWS standard includes criteria of collecting water-related data for the catchment, including water governance, water quality and WASH related data (AWS, 2019). Installation of adequate meters for monitoring water quality, detecting leaks, measuring overall water use and relatively water use of processes (CEO Water Mandate 2019).

Water footprint standard and calculation methods based on life cycle assessments are available and already used by companies to some extend (Hoekstra et al., 2011) & ISO 14046:2014). Water footprint concept explains direct and indirect water use of a consumer or a product (Hoekstra et al., 2011). Water footprint assessments are not yet systemically integrated in value chain operations (Vlachos and Aivazidou 2018). New ISO14001 collection was published in 2015 and new version includes standard 14046 which links LCA to water footprint assessment concepts. It also requires taking environmental issues as part of business strategy and highlights risk assessment approach with identification of risks and possibilities (ISO 14046:2014). In addition, corporations must consider significant environmental aspects of their outsourced processes and influence those processes with suitable management methods. Water footprint as a key performance indicator has been introduced to national, company and product levels (Aivazidou et al., 2016).

2.1.5 Value chain engagement

Effective corporate water stewardship needs external actions that focus on value chain engagement (Newborne and Dalton, 2016). Corporations are not always able to know the full lifecycle of their products and services. When origin of the raw materials in not known, assessing local water risks and creating actions to improve water use cannot be done. Only 40% of corporations reporting water issues trough CDP conduct value chain engagement (CDP Water, 2018). Complexity of value chains create the biggest challenge for corporate water stewardship (Jones et al., 2015). Engagement and collective actions should be part of corporate strategy, financial decisions, marketing and operation (WWF, 2018).

Collective action mobilizes different stakeholders within watershed, regions or countries to acknowledge water-related issues (Sarni, Grant, 2018). Distinguishing stakeholders is important because implications of water stewardship are different for stakeholder groups such as local communities and shareholders (Newborne and Mason, 2012). Collective action calls stakeholders at the watershed to participate in corporation's activities (CEO Water Mandate et al., 2013). Local affected communities, academia and other water users, among others, should be considered as stakeholders. CEO Water Mandate has listed several different collective actions as listed later in this chapter. The list includes actions between efficient water use to improving access to water services in communities. Philanthropic actions and ideology of "paying back" are far behind of water stewardship ideology (Newborne and Mason 2012). Taking water stewardship as part of corporate strategy leads to shared value creation and reduces the pressure to use philanthropic actions to cover the harm caused by corporation. Collective action can refer to information exchanging, engaging in long partnerships with suppliers or other organizations, facilitating improved water performance among suppliers and partners etc. (CEO Water Mandate 2019).

Local river basin management authorities should always be included in collective action (CDP Water, 2018).

According to CEO Water Mandate (2010) different types of collective action are:

"Encouraging efficient water use across a catchment"
"Contributing to the development of effective and equitable policy and regulations"
"Supporting research, advocacy, and monitoring"
"Aiding environmentally and socially responsible infrastructure development"
"Sharing or gathering data related to water resources"
"Establishing or engaging in participatory platforms and other democratic processes for water governance decision-making or oversight"
"Advancing public awareness of water resource issues"
"Operating infrastructure (e.g., wastewater treatment) for community and municipal uses"
"Working with communities to improve access to water services"
"Assisting with finance of local water supply and sanitation infrastructure"

CEO Water Mandate (2010) has outlined five principles for responsible engagement:

Principle 1: Advance sustainable water management. *The engagement in water policy must be motivated by a genuine interest in furthering efficient, equitable, and ecologically sustainable water management.*
Principle 2: Respect public and private roles. *Responsible corporate engagement in water policy entails ensuring that activities do not infringe upon, but rather support, the government's mandate and responsibilities to develop and implement water policy. Acting consistently with this principle includes a commitment to work within a well-regulated (and enforced) environment.*
Principle 3: Strive for inclusiveness and partnerships. *Responsible engagement in water policy promotes inclusiveness and equitable, genuine, and meaningful partnerships across a wide range of interests.*
Principle 4: Be pragmatic and consider integrated engagement. *Responsible engagement in water policy proceeds in a coherent manner that recognizes the interconnectedness between water and many other policy arenas. It is a proactive approach, rather than one responsive to events, and it is cognizant of, and sensitive to, the environmental, social, cultural, and political contexts within which it takes place.*
Principle 5: Be accountable and transparent. *Companies responsibly engaged in water policy are fully transparent and accountable for their role in a way that demonstrates alignment with sustainable water management and promotes trust among stakeholders*

2.1.6 Transparency

Transparency relates to reporting of water-related metrics (CDP Water, 2018). Sustainability reporting has become general for many companies and is mandatory for large companies (Directive2014/95/EU, 2014). Reporting of water-related metrics can be part of general sustainability reporting, but water data is quite often incomplete (CDP Water, 2018). Corporate social reporting has increased during last years and there is large variation of choices on different CSR reporting standards and frameworks (Caplan et al., 2013).

Transparency of corporations' direct and indirect water use is still in a poor state (Hoekstra et al., 2015). Total water consumption or water withdrawal numbers don't tell about water risks if catchment context or the location is not taken into consideration (Larson et al., 2012). Transparency is crucial part of corporate water stewardship, but only broad guidelines provided for that (Ceres, 2010, CEO Water Mandate, 2010). Different communication cultures and technical nature of water stewardship concepts are hindering transparency (Sojamo, 2015).

2.2 Value chains

Value chains can generally be described as structures of production and trade that consist of raw material producers, suppliers, manufacturers, distributors, retailers and customers (Mangan and Lalwani, 2016, Sojamo, 2016). According to Mangan and Lalwani (2016) difference between value chains and supply chains comes from the value added to a product during production. Supply chain refers to downstream material flows from source to consumer (Figure 2). Value chain refers to functional inputs that corporation provides to production from resource to delivered product in a broader view of a chain where each step adds value to a product and value is not created only within the focal corporation but also by different firms that are part of the value chain from a source to customer (Mangan and Lalwani, 2016, Wenzhong, 2015) . Global value chains (GVC) connect workers, consumers and firms around the world and integrate also developing countries and low-income countries to value chains (Gereffi and Fernandez-Stark 2016).

In a global world value chains are also global and quite often long and complex due to that (Grant et al., 2017, Mangan and Lalwani, 2016). Outsourcing is an ongoing phenomenon in global business (Mangan and Lalwani, 2016). It can be defined as "*the transfer to a third party of the management and delivery of a process previously performed by the company itself* ". Reasons for outsourcing are related to cost reduction, flexibility and advanced technological requirements (Mangan and Lalwani, 2016). Cost reduction can be also done by offshoring which means transfer of specific processes to lower cost locations in other countries (Mangan and Lalwani, 2016). Usually wages are lower, and control of regulation is lesser in these locations. Offshoring can increase transaction and monitoring costs but reduces the overall costs. However, outsourcing can bring challenges and disruptions (Mangan and Lalwani, 2016). Outsourcing and procurement decisions have reduced corporations' control on their daily operations leading to increasing need for corporate responsibility. Cultural differences, varying policies and regulations and higher exchange rate risks are affecting are characteristics defining global value chain and creating challenges for value chain management. (Aydin et al., 2014).

Value chain consist of different steps from the resources to the end-product and to the end of use (Figure 2). Many value chains are complex; e.g suppliers refers to several tiers of suppliers, which means suppliers and their suppliers, but simplified model will be used here. This research focuses on the upstream side of the value chains. Upstream in this context means the part of a value chain from core company to suppliers (Mangan and Lalwani, 2016). The other side towards consumers is downstream. Consumers are important part of the supply chain and it is important that information about supply/value chain reaches consumers but at this point focus is more on the side of gathering information of the value chain. It creates a basis for further use of this information for consumers.

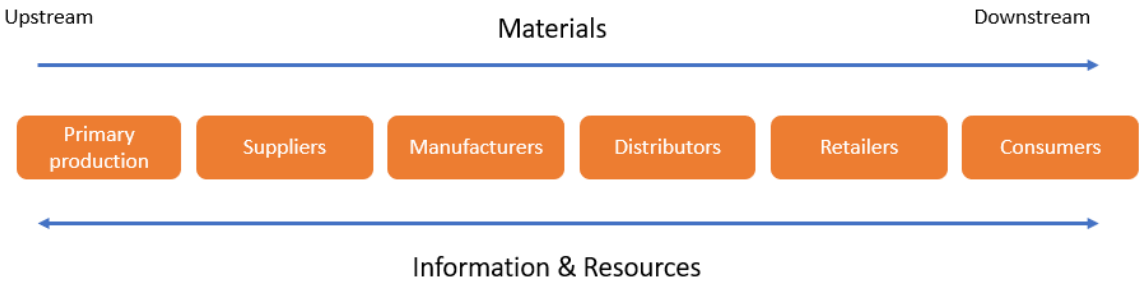

Figure 2. A simple value chain model

There are three different flows encompassed in value chains; information flow, material flow and resource flows (finances, people, equipment but also good relationships) (Mangan and Lalwani, 2016). In traditional model, value chain is liner but in in circular economy models, material flow from consumers back to production (Sarni and Grant 2018).

2.2.1 Value chain management

Definitions of value chain or supply chain management vary (Fawcett and Magnan 2002). According to Mangan and Lalwani (2016):

> "*Supply chain management (SCM) is the management, across and within a network of upstream and downstream organisations, of both relationship and flows of material, information and resources. The purposes of SCM are to create value, enhance efficiency, and satisfy customers*"

Value chain management has evolved quite a lot during last years from the focus on the boundaries of one corporation to strategic sourcing and understanding supply chains as large entities of complex business (Laseter and Oliver, 2010). Globalisation and focus on core competencies of corporations have increased outsourcing which requires well-structured coordination and management of suppliers (Grant et al., 2017). Three principles of value chain management are 1) setting supply chain policies strategically, 2) Analyze trade-offs holistically, 3) Employ cross-functional support system (Laseter and Oliver, 2010).

Procurement is increasingly important for corporations who have global value chains (Mangan and Lalwani 2016, Gereffi and Fernandez-Stark 2016). Procurement strategy of corporation rises from legislation, regulations and values of a corporation (Wenzhong, 2015). "Faster and cheaper" vision in procurement can cause problems such as environmental harmful production, false marketing, and unsafe and unreliable auditing (Wenzhong, 2015).

Table 2. The procurement process (Mangan and Lalwani, 2016 page 153)

Stage	Description	Key issues
Specify	Specify the requirements the contract must deliver	• Requirements should be defined from a technical, commercial and end-user perspective. • In many cases organisations do not understand the market better than suppliers. • Sometimes the specification is unclear or ambiguous
Identify	Identify suitable potential suppliers who are able to meet the defined requirements or specification	• Advertising and promoting the contract opportunity • Determining an appropriate level of competition to reflect the risk and value being procured. • Attracting new or more interesting suppliers who may be able to add more value to your business versus incumbent. • Choosing which suppliers have the capability and capacity to deliver the required service
Select	Select a suitable supplier or suppliers to deliver the contract	• Picking a winner from suppliers who have sufficient capability and capacity to deliver the contract. • The evaluation criteria in terms of quality and price. • The balance needed between quality and price
Manage	Manage the contract to ensure the key deliverables are fully met	• Success criteria or key performance indicators are required to ensure the contract requirements are being met. • Lessons learnt are applied to subsequent contracts

Sourcing and procurement play a big role in value chain management and their criteria is changing. Procurement processes require many steps and considerations Table 2. A new discourse of value chain management has been strategic sourcing (Aydin et al., 2014). Price is not the only aspect but also services beyond it. Corporations are reflecting consumers' changing attitudes and considering also environmental and social issues while making sourcing decision (Mangan and Lalwani 2016, p.144-165). Corporations are adapting environmental management systems (EMS) which help implement environmentally sustainability practices both inside and outside of corporation boundaries (Darnall et al., 2008).

Sourcing strategy defines how a corporation procures items and ensure continuity of supply with the best deal. Private sector has a freedom to make procurement decisions that support the objectives of a corporation. (Mangan and Lalwani, 2016 p.144-165). Corporations are not obligated to publish their contracts or follow specific criteria with their procurement. This differ from public procurement which is regulated by EU directives and must be transparent and open (Directive2014/95/EU, 2014). Private procurement specifies requirements, identify sources and acquire resources that are cost effective, sustainable and fit for corporations' purpose (Mangan and Lalwani, 2016). Procurement decisions balance between supplier and buyer motivations; while buyer wants the lowest price and power supplier wants the highest price and power (Mangan and Lalwani 2016, p.144-165).

Kraljik's power matrix (Figure 3, Table 3) analysis is still the most used tool for making decisions about purchasing and supply (Cox, 2014).

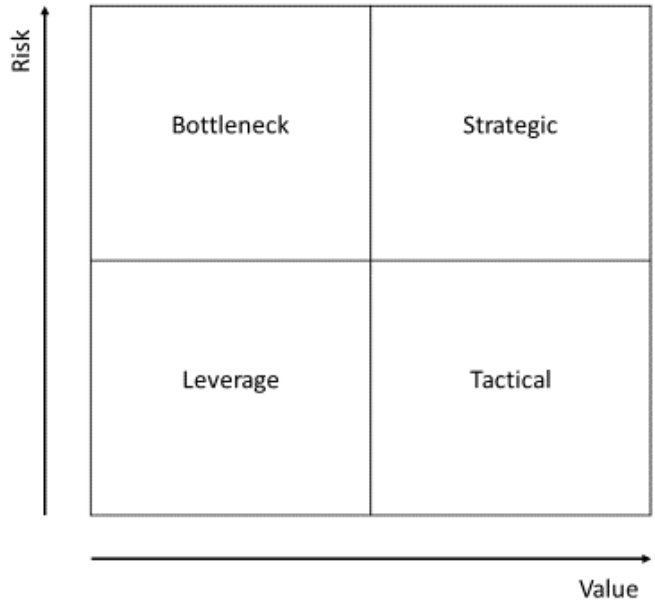

Figure 3. Kraljik's power matrix (Cox 2014).

TABLE 3. Managing procurement portfolios (Mangan and Lalwani 2016, p. 148)

Risk / Value	Description	Strategy
High / High	Strategic	Work strategically and collaborate. High risk and high value usually represent a high dependency relationship with a supplier with high exit costs. Source and manage strategically.
High / Low	Bottleneck	Need to be managed carefully. The bottleneck may be technical or commercial but to reduce the risk, buyers have to design the bottleneck out or their portfolio or ensure an appropriate relationship with the supplier is maintained - to ensure continuity of supply
Low/ High	Tactical	Tactical procurement required to ensure value for money is achieved from the most appropriate source or sources. Increase sources and maintain competition between suppliers.
Low/ Low	Leverage	Aggregate and consolidate spend. Low-risk/low-value items are like commodities where source is less important than continuity of supply and assuming all other performance requirements are met - source on price.

Integrated supply chain management systems have become more popular (Boyd et al., 2007). Supply chain management usually refers to advanced information technology, effective supplier management, rapid logistic services and customer service management (Fawcett and Magnan, 2002). Corporations understand the concept of SCM but mapping the actual extensive supply chain with suppliers' suppliers is more uncommon. Definitions of SCM also

vary between corporations and functions. Themes in all definition emphasize collaboration, co-operation, integration and coordination with understanding of cross-discipline nature of SCM (Frankel et al., 2008).

Supply chain orientation (SCO) is less studied aspect of supply chain management. It means the recognition by a company of the systemic, strategic implications of the activities and processes involved in managing the various flows in a supply chain. (Esper et al., 2010). Esper et al. (2010) suggest that SCO must be first acquired within an individual firm to achieve effective SCM. In other words, it means that all individual companies should have structures that support SCM and helps to include SCM to a strategy of an individual supply chain firm.

Corporations have added different instruments to their supply chains to improve supply chain responsibility. Corporations always monitor their suppliers at some level and pressure for this has increased during last years (Boyd et al., 2007). Each value chain has one core corporation that is expected to have responsibility of the whole value chain (Gereffi et al., 2005). Boyd et al. (2007) has identified challenges with monitoring 1) corporations have different monitoring procedures, and this leads to inconsistency of monitoring, 2) with inconsistent data, comparing different supply chains and their performance is challenging, 3) high level monitoring can create an environment where supplier don't trust to buyer corporations. One aspect of value chain management that is not fully understood is relationship management inside the chain (Mangan and Lalwani 2016, p.144-165).

Collaboration between stakeholders in value chain requires willingness to share information (Du, 2012). Technology for information-sharing in the value chain is available but due to dynamics of sharing information in a multi-tier value chains it remains challenging (Kembro and Näslund, 2014). Collaboration involves trust between partners, joint problem-solving, commitment and partnership coordination (Du, 2012). Close linkage between partners in the supply chain is requirement for agile value chain and leads to improvements in many sectors of supply. Corporation are careful of shared information because some partners might be future competitors.

Complexity of value chains and outsourcing have transferred the corporation risk more to the value chains (Mares, 2010, Grant, Trautrims & Wong, 2017). Strong value chain management reduces vulnerability of a corporation and increase resilience. Identifying known risks and weaknesses can be done through questions below (Mangan and Lalwani 2016, p. 255-273):

"*What has disrupted operations in the past?*
What known weaknesses do we have?
What 'near misses' have we experienced?"

While corporations report their accidents such as exceeding limits in environmental permits near misses are not reported (Mangan and Lalwani 2016, 255-273). However, near misses could be considered as warnings of actual misses (Mangan and Lalwani 2016, 255-273). Proactive value chain management considers also possible effects of risks:

"*What would be the effect of a shortage of key material?*
What would be the effect of loss of our distribution site?

What would be the effect of the loss of a key supplier or customer?"

3 Analytical framework

Analytical framework (Figure 4) of this thesis combines corporate water stewardship theory to value chain and value chain management theories. Corporations are having challenges to expand corporate water stewardship beyond their internal actions (Newborne and Dalton, 2016). Thus, combining value chain management tools and theories to each part of water stewardship progression is reasonable.

The CDP Water Program framework (Transparency, Risk assessment, Targets and goals, Measuring and Monitoring, Governance and Strategy and Value chain engagement) creates the foundation for this thesis's framework in which I have applied theories from value chain and supply chain management studies.

Value chain themes were selected as per what would be most important for water stewardship context. Selection was done based on value chain and value chain management literature. There were already some linkages between water stewardship and value chain management literature and these linkages were used and developed further in this research. The linkages considered e.g. contracts and procurement.

Based on literature review and the analytical framework the following research questions were derived.

Research questions

1) What are the challenges corporations face regarding water stewardship in their value chains? How do they tackle these challenges?
2) How is water stewardship managed across corporate value chains and what tools are needed for the management?

Figure 4. Analytical framework established for the thesis.

4 Materials and methods

Case study analysis was selected as a research approach for this study. Literature review, document analysis and case study interviews were used as data gathering methods. Data was analysed with content analysis.

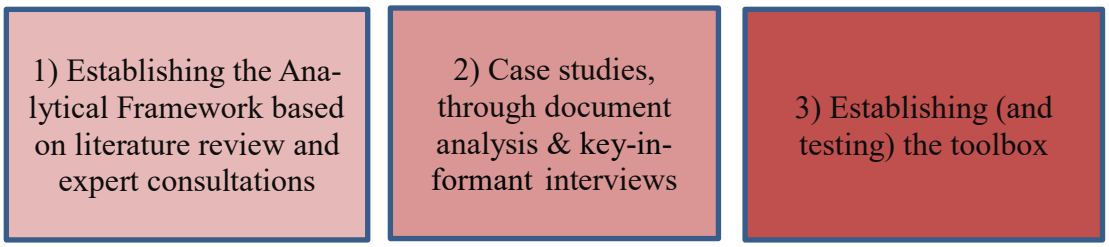

Figure 5. Progress of the thesis

4.1 Case study analysis

Case study analysis was used in this study as a research method to explore how water stewardship is managed in corporate value chains in practice and understand what challenges

corporations face with water stewardship. Case study allows retaining the holistic and meaningful characteristics of real-life events (Yin, 2009). For this thesis, case study analysis enabled comparison between corporations and their water stewardship challenges.

Literature review was firstly used for establishing the analytical framework that was later utilized for content analysis. Document analysis explored corporate literature to gain baseline data from corporations later interviewed. Corporate literature stays often at a very general level and does not usually go into practical details. Thus, interviews were included to gain deeper knowledge on corporate operations, actions, challenges and solutions regarding water stewardship and sustainable water management.

4.2 Literature review and expert consultations

Literature review was initially used for establishing an analytical framework for the thesis. Literature applied can be categorized to supply and value chain literature and water stewardship literature. Additionally, literature about corporate laws and strategies was reviewed to understand the regulations that corporations follow and the environment in which they work. Literature was collected with key word search from online databases such as Finna and Google scholar. Another method was the snowball method; references in scientific articles lead to another publications. The purpose of a literature review was to understand the functions and dynamics of value chains and what is the role of water and water stewardship for value chains and value chain management.

Later, literature review was used for toolbox building. Value chain management tools, practices and strategies were collected from literature and combined with data from interviews.

Expert consultations with external experts, the thesis supervisor and advisors were involved throughout the thesis process but especially at the beginning when the topic and specific content of the thesis were discussed. These discussions helped to find the focus for the thesis and emphasis on value chain aspect of water stewardship. Additionally, expert consultations supported the establishment of the analytical framework and helped to identify the scope of it.

4.3 Document analysis

Another literature source was different corporate reports from interviewed corporations and corporations who are performing well with water stewardship. CDP water reports and annual reports of corporation from last three years (2016-2018) were utilized for this thesis. CDP reports were found through their data bank and annual reports were used if they were available at the corporations' websites. Some corporations have published their Code of Conducts and Due Diligence criteria which were utilized if available.

Annual reports, CDP reports and other corporation material were read before interviews. Published material gave a good insight where a corporation currently is with water stewardship and with overall responsibility. In addition to the interviewed corporations, reports from corporations who are at advanced level with their water stewardship were used for benchmarking purposes.

Document analysis included also materials of environmental and sustainability standards, certification criteria and reporting guidelines which corporations have utilized. These materials were read to understand how much water is considered in them.

4.4 Key informant interviews

The purpose of the interviews was to collect practical insights on corporate water stewardship, contributing this way for the case studies.

In total, eight interviews were conducted for this thesis, including six corporate interviews and two expert interviews. Corporations' interviews represented Finnish corporations that have a proven track-record on water related activities or that have showed interest towards water stewardship. In addition, one value chain expert and one water stewardship expert were interviewed to understand corporate water stewardship in a bigger context. Corporate representatives as key-informants work with corporate responsibility, environmental management, corporate affairs and communication in different levels. Each interview took approximately one hour.

Interview method was semi-structured interview which means that themes and some of the questions were planned, but questions were not strictly defined (Bryman, 2012). Interview questions considered water stewardship and challenges faced with it, corporation's value chain management and corporation's sourcing strategies. The purpose of the interviews was to gain practical knowledge of water stewardship as a part of value chain management. Questions are presented in Appendix 1. Some information was already available in annual or sustainability reports of corporations so not all the questions were discussed in interviews. Interview questions were created based on the CDP Water 2018 report and key steps of water stewardship progression (as listed e.g. in water stewardship commitments).

Questions for water stewardship and value chain expert were different from corporate representative interviews. Questions for experts had an emphasis on their know-how and focused on the broader view of both value chains and water stewardship.

4.5 Content analysis

The data from the interviews and the corporate reports were analysed based on their content. Data of each corporation was treated as an individual case and then cross-case synthesis was applied. Cross-case synthesis can be used for analysing similarities with cases and how they are linked to different themes. (Yin, 2009). A theoretical sampling method was used to identify common challenges of corporations which were then developed to analytical categories (result categories) (Bryman, 2012). This method can be used when key concepts can be defined and used for data collection and then for developing a new theory. In the thesis, the new theory refers to the toolbox building. The analytical categories were later used for toolbox development. Selected corporations representing different business sectors and having unique value chains for each sector provided a more robust analysis.

4.6 Toolbox for water sustainable value chain management

Based on the literature review and the interviews a toolbox for managing corporate value chains was developed. The toolbox provides possible practical solutions to the most common challenges that corporations face with water stewardship. Additionally, idea behind this categorisation was to provide tangible tools for value chain management to different sectors and business units of each corporation.

Toolbox approaches, which refer to toolbox categories that include several tools, were created after interviews and literature review based on the challenges identified through the analytical framework. The role of water stewardship in each corporation varied but similar barriers and challenges were found. Content analysis showed that most barriers and challenges were linked to specific themes; these themes were then developed to result categories and further to toolbox approaches. Approaches are legislative and policy, contractual, strategic, resource efficiency, voluntary and communication and stakeholder engagement.

After establishing the toolbox, it was tested in a workshop that was part of a release event of "Finnish companies the most responsible water stewards in the world – roadmap for 2019–2030" -publication (Sojamo et al. 2019). The toolbox was presented in the event and participants had a chance to comment on the content and structure of the toolbox. The participants had some additions for the tools and comments on how to improve the structure so that it would be as clear as possible and easy to utilize.

5 Results

This results chapter combines results from the key-informant interviews and corporate literature. Information related to the interviewed corporations is anonymised. In addition to corporate literature of interviewed corporations, corporate literature of other corporations, which are performing well with water stewardship, were used for benchmarking purposes. These corporations are mentioned by name. This results chapter presents challenges that corporations have with water stewardship and possible tools which are used to overcome these challenges. Results are categorized to eight sections. Decision to categorize results under themes rather than present results by each corporation originated from the will to retain corporation anonymity. Same categorization is applied in the toolbox.

While all the interviewed corporations presented that sustainability and responsibility are key issues for their business, they have challenges to extend sustainability to their supply and value chains. Sustainability is an important part of corporate strategy, and most of the cases also integrated into corporate strategy. However, water and water stewardship are parts of overall responsibility or sustainability. Environmental sustainability has focused on climate issues and water stewardship has not yet received the special focus in corporations.

Water stewardship is mostly limited to corporations' own activities and importance of water stewardship within value chain is recognised and acknowledged in a principle level, but actions are missing. Several reasons are behind these limited actions; e.g. lack of information on value chains and their complexity.

Industrial sector and value chain dependency on water define the importance of water stewardship for a corporation. Some of the interviewed corporations have global sourcing and some source main raw materials from the Nordics or from Europe. This is one reason why corporations have given different weight to water stewardship and consider its importance. In Europe and in the Nordics water availability and water management are at better level than in many other areas (WWF Water Risk Filter 2019).

The water stewardship approach encourages corporations first to evaluate their water risks and after that to create water strategy and set targets and goals. Most of the corporate commitments were focused on water consumption reductions and reducing water pollution. Some of the interviewed corporations have analysed their water risks but were having challenges with target setting and deciding what are the most relevant targets for them and for their business sector.

Interviewed corporations were relatively transparent on their operations and raw-material origins regarding their primary raw-materials. Sustainability and responsibility are clearly part of their reporting and communication. However, practical examples of sustainability actions were sometimes missing.

5.1 Legislative and policy approaches

Legislation varies between countries and corporations must obey the law of the country they are working at. Many corporations considered limits in their environmental permits as the baseline for their responsibility and sustainability. Legislation regulating value chains is quite complex and challenging. Policy approach refers to means for implementing legislation.

Key findings from the interviews regarding this theme can be summarised as follows:

- Permits are monitored and audited usually only in corporation's own facilities and first-tier supplier's facilities due to a contractual relationship.
- Corporations have environmental management systems such as ISO 14000 standards in use and they consider the standards as a baseline for their sustainability.
- If suppliers obey the law, corporations do not have much power to demand additional focus on water.
- Water stewardship has a role on corporate policy to some extend but hidden under overall environmental or sustainability policies.

Environmental permits are legislative tools that regulate the limits of water withdrawals, wastewater and nutrients in wastewater. Corporations see that they operate sustainably when they follow permits. Environmental permits also regulate how and how often corporations must conduct water quality measuring and reporting. Environmental permits and environ-

mental monitoring are different in different countries. In Finland corporations are responsible of taking water samples and report on the results. According to one interview in some other countries where they operate, water samples are taken by agent outside corporation. The same corporate representative said that Finnish system is better, because it creates ownership and responsibility for a corporation.

One problem in every value chain are challenges with data collection. The core company may not get water data from its' suppliers or sub-suppliers which makes it difficult to assess and regulate water use in value chains. Water measuring is often done only if required by law. According to one interview, it is assumed that water measuring is required in countries suffering water scarcity.

Audits are one of the most used tools to monitor suppliers. There is a variation of auditing systems, and one supplier can be under many different audits. Some corporations do their own audits and some audits are done by external evaluator. If certificates are used, parties approved by the certificate initiatives conduct the auditing. Water issues are usually part of the supplier auditing but not always. Audits can include water issues as part of environmental auditing or as a separate unity. Some audits do not consider water issues at all if water is not relevant for the operations or because it has been left out due to other reasons.

Frequency of audits depends on corporations and performance of their suppliers. When corporations have plenty of suppliers, they cannot monitor everyone. Auditing is focused on primary suppliers or suppliers that have had problems in previous audits. One representative from corporation that has suppliers in water scarcity areas said that all suppliers in water risk areas or in target countries are audited in every second year and if problems are found, audit is carried out every year.

Need for combined auditing systems was brought up by a few key-informants. Audits provide important data but because each corporation conducts own auditing, several audits can be targeted to one supplier. However, commercial secrets are possible limiting factors for combined audits.

According to a water stewardship expert, eliminating illegal actions such as suppliers or manufacturers working without valid environmental or water permit is more efficient approach to improve corporate water stewardship than refining legal actions. While corporations do not have measured water data of the operations and actions in their value chains, they do not have water related target setting for their value chains either.

One of the key-informants said that policies and regulations set by national governments do not provide enough answers for global concerns. Corporations have a significant role to move things forward. According to another corporate representative, foreign corporations are monitored more carefully by the country than domestic corporations.

Corporates' ability to influence depends on the size of a corporation. Finnish corporations can be large in Finnish context and scale but compared to other corporations working globally they may not be considered as large ones. Many corporations can procure raw materials from one geographical or basin area, thus in that context more sustainable decisions made by one corporation do not change the whole situation.

Water stewardship is most often discussed as part of environmental or sustainability policy. Many key-informants mentioned that because climate change has taken quite a big part of their sustainability/responsibility work, water is not yet in the focus. Generally, water is one part of environmental work, and many times important and natural part of it. However, actual examples of water-related sustainability actions are not communicated.

5.2 Contractual approaches

" *It's easier to investigate risks beforehand than fix problems afterwards*."

This chapter presents contractual approach to water stewardship, meaning the ways how corporations have considered the role of water stewardship in value chains through contracts. Contracts in this context refer to the contract package between supplier and core corporation. This package usually includes actual contract and appendices such as Code of Conducts. Contracts are a rather clear way to set rules for business and what is expected from suppliers. Contractual approach also includes certificates, that are voluntary additions on supplier requirements.

Key findings from the interviews can be summarised as follows:

- Most contracts are done with first-tier suppliers, which means that contractual relationship does not reach suppliers in other tiers.
- Corporations obligate their suppliers to commit to Code of Conducts, ethical guidelines etc. required in the actual contracts.
- Corporations' water stewardship or sustainability targets for the value chains usually comes from Code of Conduct.
- Water stewardship has no specified role in contracts.
- Corporations use different material certificates, but are not always aware of the role of water in the certificate criteria.

Most corporations have a contractual relationship with the first-tier suppliers. Due to this, they can make requirements for suppliers in other tiers only through the first-tier supplier. Additionally, a lack of contractual relationship hinders possibilities for communication.

Some interviewed corporations have contractual relationship with their direct suppliers. Some corporations have direct raw-material suppliers, thus they know the exact origin of that material. This enables controlling raw material production closely and having a direct dialogue with supplier. Corporations can monitor their suppliers, request information and collaborate with suppliers more directly. Additionally, this strengthens the ability of corporations to conduct community-based philanthropic projects with supplier communities and define the project that are needed and most beneficial for the community.

All interviewed corporations use ethical guidelines like Global Compact ten principles (UN Global Compact 2019) or Codes of Conducts specified by a corporation. These documents also usually set the baseline for sustainability targets that corporations have for their suppliers. Corporate representatives said that they trust their suppliers to require sustainable courses of actions from the supply chain under them.

Corporations trust their certification and standard systems but certification criteria e.g. what is the role of water, is not always clear. Certificates are possible and useful tools for traceability and sustainability of value chain. However, certificates are usually for specific purpose or for specific raw material, thus certificates do not necessarily consider water use extensively and so water stewardship cannot be guaranteed only by these certificates. However, AWS international Water Stewardship Standard or Certificate are not used in any of the interviewed corporations.

5.3 Strategic approaches

"There is no point building a water intensive factory in Sahara."

Strategic approach refers to integration of water stewardship into higher level of corporate decision making. This chapter presents the role of water stewardship in business strategies relating to value chains, procurement and risk assessment.

Key findings from interviews can be summarised as follows:

- Corporations have assessed their water risks; as included in general risk assessment or separately.
- Corporations emphasize physical water risks, especially water availability.
- Water stewardship strategies differ between interviewed corporations:
    - Some corporations have or are developing a separate water stewardship strategy.
    - Some corporations have integrated it to sustainability strategy (or to business strategy if sustainability strategy is part of that) but water does not have a specific role.
- Sustainability issues are discussed at a board level.
- Acknowledgement of value chains in water stewardship strategies is low.
- Role of water in procurement strategies varies but it is under development.

Water-related risks are often somehow integrated into regular risk assessment. Especially corporations who have water-intensive operations consider water-related risks important. However, corporation might not be aware what type of risks they are dealing with. Most of the interviewed corporations mentioned water availability as the primary risk. Reputational risks came up in few interviews. According to water stewardship expert, negative reputational effects do not have long-term impact for corporations.

Three of the corporations told that they or their suppliers have operations and activities in water stress areas, or they source raw materials from such areas. One of the corporations mentioned that water risk was acknowledged before the business was started at that area and that technology and operating is designed for those circumstances. This technology includes for example water recycling, improved wastewater treatment and collection.

Procurement strategy

Corporations are quite aware what are the water risk areas of their operations and sourcing. In addition, supply chains of priority materials are quite well-known. Corporations are developing procurement strategies that have more weight on sustainability.

Understanding water stewardship within value chain requires data of raw materials, country context and data about supply chain construction. This is affecting especially corporations that use large variation of raw materials from different origins.

Some of the raw materials are only grown in water scarcity areas and some raw materials are really water intensive. One corporation uses raw materials that naturally grow only in water scarcity areas. To avoid increasing water scarcity in these areas, corporation has transferred processing to another location. One corporate representative brought up the decision to choose 'better materials' as a tool for managing water risk. Water intensive materials like cotton could be replaced with linen or increase the use of recycled materials. Another thing that a corporation can do is shortening their value chains. Ideally supply chains are short and several processes are carried out in one factory or in the same area.

One interviewed corporation has sourcing procedure explained on their website. This sourcing procedure integrates sustainability to material and supplier selection procedure before the actual supplier tendering process. Only sustainable suppliers are selected for candidates to tendering process. Some corporations make sustainability assessments of suppliers at the point where they have a few supplier candidates. One corporation mentioned that they have integrated procurement system which helps to manage suppliers. This is also something that many other corporations are developing.

Climate change and CO_2-emission reductions have been in the focus of corporations' environmental sustainability and water stewardship has not yet received significant focus. However, corporations are committed to GHG reductions and so would use the same analogy with water stewardship.

5.4 Resource efficiency approaches

This chapter presents resource efficiency aspects of water stewardship in corporations. Resource efficiency refers to solutions that are efficient relative to finance and natural resources. These solutions include e.g. technical development to reduce water use or improve water efficiency. Currently, corporations are taking the first steps with water stewardship with water risk assessments and with water use efficiency targets. These both require modelling, measuring and in operational technology.

Key findings from interviews can be summarised as follows:

- Water efficiency usually equals to energy efficiency and through that to financial efficiency and is beneficial for a corporation.
- Development of advanced technology needs proper infrastructure which is not available in every country or location.
- Corporations do not have or do not receive enough water data.

- Sustainability work has focused on climate change issues.

Improving water efficiency is beneficial from the water stewardship perspective when water use is high. It is also beneficial from the financial point of view since for every litre of used water corporations use money.

Some water efficiency challenges that corporations brought up were: varying wastewater content which requires advanced treatment technology; water recycling is not possible without proper, already existing infrastructure and tightening legislation regarding nutrient limits; and water efficiency. Especially corporations with water-intensive operations measure their total water consumption. However, locating the biggest water using parts of the process is difficult without extensive measuring system.

Variation of targets is large and depending on the sector where a corporation works. Some corporations have numerical targets such as reducing chemical oxygen demand, or water use per production unit, and some have more strategical perspective. On the other hand, one company working in the textile sector has more strategic perspective and they are aiming to take more water-related issues into account while making decision on materials.

Since most interviewed corporations approach water stewardship with water use efficiency targets, they have applied new technologies to reach these targets. Technological solutions improve wastewater treatment and increase water recycling. Some of the drivers for improving technology come from legislation and local regulations.

Improved technology e.g. with wastewater treatment is also considered as a cost reduction. Exceeding limits of environmental permits cause fines for corporation. As said by the key-informants, consumed water means consumed money. Thus, effective use technologies such as water recycling saves money. In water scarcity regions, efficient water use is mandatory and at least new factories are designed as water efficient. According to two corporate representatives measuring water use is required by law in the water scarcity countries. However, when supplier work in countries where infrastructure is overall weak, applying water recycling systems might not be possible.

Capacity-building via technical solutions and technical education was also mentioned on corporation interviews as well as in value chain expert interview. One of the interviewed corporations has paid "sustainability extra" to corporations if they decided to commit to more sustainable business by changing their actions to meet certification criteria.

5.5 Communication and information sharing approaches

"*If corporate operations are not on a sustainable basis, it is impossible to communicate of anything else."*

This chapter discusses communication and information sharing of water stewardship in value chains. Communication refers to communication between agents in value chains but also to transparency as a part of external communication of a corporation. Information sharing refers to information flow in value chains and information collection from suppliers.

Key findings from interviews can be summarised as follows:

- Corporations are relatively transparent of their operations.
- Discussion on water stewardship with suppliers is sometimes challenging.
- Information from suppliers is collected with questionnaires and audits.
- Information collection is disconnected.
- Platform for shared information is needed.

Interviewed corporations were relatively transparent on their operations and raw-material origins regarding their primary raw-materials. Sustainability and responsibility are clearly part of their reporting and communication. Some corporations publish a separate sustainability report annually and some corporations have integrated sustainability and/or responsibility in their annual report. Water is one part of these reports. However, practical examples of sustainability actions are sometimes missing.

Most of the corporations present their standards, certificates, codes of conducts, ethical principles etc. on their websites. Also, possible hazards are often mentioned in the annual reports. Some corporations mention their suppliers, suppliers of their key materials or the country of suppliers or raw materials. However, this usually tell only the manufacturing country and does not provide other details of value chain.

Corporations do have dialogue with their suppliers and water is part of the discussion because water is acknowledged as an important resource. Two key-informants mentioned that water can be a difficult topic to talk about. Knowledge of water issues is at a good level in the Nordics, but knowledge level is different in other countries and sometimes it is quite difficult to find common understanding about water issues. The core corporation might have clear vision how to tackle water related challenges, but suppliers or other stakeholders are not even familiar with the topic. This causes challenges for discussion and it might not be understood why these Finnish corporations ask such questions. Strong and trustworthy relationship with suppliers help with information collection.

Information of value chains and suppliers are usually connected through audits, questionnaires, monitoring visits and dialogue. Most common water measurement is water used per production unit. This data is collected and compared to previous year. Large increase is discussed and reasons behind this are assessed. Information collection is not uniform, and many corporations ask similar questions from one supplier. In many interviews, a need for a platform for sharing information or combined information collection was brought up. While the information collection is itself a problem, information flow is often limited to one direction. Information flow to downstream direction is more common than to upstream direction. This means that core corporations collect and receive information from their suppliers, but analysed information does not flow back upstream.

One corporate representative said that while they have many suppliers they mostly discuss with their biggest suppliers. Dialogue usually reaches the first-tier supplier or the supplier that corporation have a direct contractual relation with. Strength of relationship with suppliers is dependent on the size of a corporation as a buyer. Larger buyers have more leverage.

Leverage rises also from long and stable contracts and cooperation; stable cooperation increases mutual trust. Dialogue supports the terms mentioned in contracts.

Traceability challenges were brought up by few key-informants. Traceability can be a problem especially when raw materials are sourced from several different countries. In addition to this, long and complex value chains complicate traceability particularly when different processes are done in different locations. Some raw materials such as crude oil and cotton are also impossible to trace to the accurate origin.

Corporations trust their suppliers and believe that they treat next tier suppliers with responsibility. Corporations have water-related data of their internal operations and some have water use data of their key suppliers. However, a corporation does not always get requested data or information from suppliers. Reactions to this vary. Some corporations except the fact that when suppliers receive lot of questions from different corporation, they cannot provide answers to all of them. Some corporations decide to re-evaluate suppliers who do not provide requested data or decide not to continue the cooperation.

5.6 Stakeholder engagement approaches

This chapter discusses stakeholder engagement in the context of water stewardship. As mentioned in the previous chapters water stewardship outside the corporation's boundaries has been challenging to implement. This is due to lack of information on value chains and difficulties in communication with the higher level of value chain tiers.

Key finding from interviews can be summarised as follows:

- Getting started with the engagement work is challenging.
- Dialogue is considered as a powerful tool to engage, but it is usually limited to first-tier suppliers.
- Corporations have philanthropic and capacity-building projects with some suppliers and communities.

Value chain engagement is the most challenging part of water stewardship and corporations are unfamiliar with how to take it into consideration or how to integrate it into their business. Many of the interviewed corporations mention in their annual and sustainability reports that they "collaborate", "promote transparency and dialogue" and "engagement" but do not tell how this is done in practice.

Corporate representatives mentioned dialogue as a powerful tool for engagement purposes. According to the representatives, continuous and repeated dialogue was the most effective way to raise the awareness on water stewardship among suppliers. Creating an impact through dialogue was considered more effective than setting strict requirements for suppliers. However, dialogue is most commonly limited to first-tier suppliers and the most important or biggest suppliers. As mentioned in the previous chapter, dialogue has more power if relationship with supplier and corporation is trustworthy.

According to WWF water stewardship ladders (and according to the water stewardship expert interviewed), the most advanced form of corporate water stewardship is influencing

water management authorities and collaborating with other stakeholders in the basin. In Finland corporations collaborate with other corporations and organizations onwater issues e.g. through Baltic Sea Action Group. In the interviews, commercial secrets were named as a restriction for cooperation with other corporations in the same basin.

Most of the interviewed key-informants mentioned that they develop new technologies with their suppliers. One representative mentioned that technological development with suppliers is quite easy and suppliers have a good mindset to provide solutions to problems. At the same time, this is efficiency-wise and s the capacity of suppliers.

Few of the interviewed corporations mentioned that they have ongoing projects or programs such as improving sanitation or supporting education at the areas where corporation works or does sourcing. WASH issues were challenging for some of the interviewed corporations, especially for those whose raw materials are sourced in developing countries.

6 Toolbox for water sustainable value chain management

While water plays a part of almost every value chain somehow, water stewardship encourages corporations to focus on their primary value chains and on value chains that are the most critical from water perspective. The toolbox presented here follows the categorization from the previous results chapter (Figure 6). The categorization can also ease the usability, since different sectors of corporations can utilize tools from the categories that are useful for them. The toolbox consists of tool categories, each including several tools. Different tools are presented in Table 4. This table presents tools and organizations providing them. Some of the tools are not provided by any organization but connected to internal actions of corporations. The tools presented here are not specific to any business sectors while those are also available.

Figure 6. Toolbox for water sustainable value chain management.

Table 4. Tools for water sustainable value chain management

Category	Tools	Providing organization
Legislative and policy approach	Water permits and requiring them from every agent across a value chain	
	Environmental permits requiring them from every agent across a value chain	
	Ensuring safe water and sanitation for employees.	WBCSD WASH at the Workplace Pledge, WBCSD WASH Self-assessment Tool
	Influencing water basin authorities who are responsible of water allocation to allow only sustainable water and environmental permits.	CEO Water Mandate
Contractual approach	Integrate water stewardship standard criteria as part of contracts	AWS, EWS
	Assessing water risks and impacts before selecting suppliers, raw materials, sourcing and processing areas.	WWF Water Risk Filter, WRI Aqueduct, ISO 14046 water footprint standard, AWARE methodology and indicators, Ecoinvent indicators
	Requirement for suppliers to be transparent on their value chains and provide all the requested information of value chains.	AWS, EWS
Strategic approach	Identifying water stewardship in the corporate context and integrating water stewardship into business strategies.	WBCSD CEO Guide to Water, CEO Water Mandate , Ceres Aqua Gauge, AWS & EWS, Context-based Water Targets, Science Based Targets Network
	Integrating water stewardship into sourcing and procurement strategies.	
	Integrating water risks as part of risk assessment	WWF Water Risk Filter, WRI Aqueduct
	Integrate water stewardship into monitoring and audits especially when water is important part of operations.	Auditing systems, AWS & EWS, CDP & GRI
	Water stewardship targets that support value chain engagement.	CEO Water Mandate, Context-based Water Targets
	Shortening value chains and using suppliers that can provide several materials.	
	Water stewardship targets that support catchment sustainability e.g. water conservation and equitable water allocation.	Site Water Targets, Context-based Water Targets, Science Based Targets Network
	Water Stewardship certificate	AWS & EWS
	Material certificates that have strong emphasis on water.	
Resource efficiency approach	Promoting water efficiency in critical parts of a value chain.	Site-level Water Targets, Cool Farm Tool Water,
	Assessing financial aspects of water risks	Ecolab Water Risk Monetizer, WWF Water Risk Filter,
	Developing more sustainable practices at the facility-level.	Ecolab Smart Water Navigator
	Water footprint assessment	Ecoinvent, ISO 14046 water footprint standard, Water Footprint Assessment Manual, AWARE methodology and indicators
	Investing in supplier and stakeholder development and capacity-building.	Water Risk & Action Framework
	Developing water quality assessment	IWRA Water quality guidelines
	Identifying water stewardship in investments.	Ceres Investor Toolkit
Communication and information sharing approach	Ensure information flow on both directions of value chain.	Water Action Hub, CEO Water Mandate
	Benchmarking; sharing best practices learned from one supplier to other suppliers	BAT -ja BEP-reports
	Collaboration with stakeholders working at the same catchment.	Water Action Hub
	Unified information collection	Amfori Bepi, Together for Sustainability, Ecovadis
Stakeholder engagement approach	Open and repeated dialogue with suppliers	
	Collective action with other stakeholders (e.g. communities, businesses, NGOs) working at the same catchment.	Water Action Hub, CEO Water Mandate Collective Action, Guide for Managing Integrity in Water Stewardship Initiatives, Water Risk Action Framework

6.1 Legislative and policy approaches

Corporation should require valid environmental and water permits throughout the value chain. In addition to this, permits should be monitored in acceptable manner.
As water and sanitation are human rights, corporations should provide these for their personnel.

At the most advanced level, water stewardship encourages corporations to influence water basin authorities who are responsible of water allocations. While corporations themselves cannot change water management legislation and policies, they can require authorities to allow only sustainable water and environmental permits.

6.2 Contractual approaches

Contractual approaches refer to means to take water stewardship as part of contracts, which would bind also suppliers for water stewardship practices. One tool for this is to assess water risks and effects before selecting suppliers, raw materials, sourcing and processing areas. This emphasizes water stewardship as part of sustainability in such selections where traditionally money has the biggest weight.

Because corporations usually have contractual relationship only with their first-tier suppliers, influencing other suppliers can be done via first-tier suppliers. To promote water stewardship across the value chain corporations can set requirements for the first tier-suppliers to be transparent on their value chains and provide all the requested information of the value chains.

Water stewardship standards provide quite detailed criteria and guidelines for water stewardship practices. suitable parts form these standards can be added to contacts. Assessment of applicability is on the responsibility of corporations.

6.3 Strategic approaches

Strategic approaches refer to strategical decision and practices to promote water stewardship inside and outside a corporation.

By integrating waster stewardship into business strategies, corporations can underline the importance of water stewardship. Furthermore, it is important to identify water stewardship in the corporate context. Apart from business strategies, water stewardship has a role in procurement and sourcing strategies as well as in monitoring and audits. Water risk assessment should be integrated in these processes as an individual part or as a part of overall risk assessment. Importance of water stewardship for processes mentioned above is dependent on business sector or industry. For instance, Ceres Aqua Gauge offers tools for establishing and evaluating water stewardship strategy and to improve corporate water management practices.

For strategy development purposes, water stewardship standards provide set of criteria to apply. AWS and EWS provide a possibility for corporate water stewardship certification.

Another tool related to certifications is the use of material certificates that have clear water criteria and strong emphasis on water, such as GOTS Certificate.

In water stewardship journey, water stewardship targets are important. For a strategic approach they could support value chain engagement, or water conservation and equitable water allocation at the catchment. One option is to use external consultant to develop more sustainable business practices that have water in focus.

Additionally, shortening the value chain and using suppliers that can provide several materials makes value chain management easier.

6.4 Resource efficiency approaches

Resource efficiency approaches refer to tools that improve water efficiency, potentially save financial resources and encourage technical development.

Water use and consumption equals of financial consumption. One way to assess financial implications related to water risks is Water Risk Monitizer by Ecolab. Developing technologies to increase water recycling or improve water efficiency in critical parts of a value chain also saves money. Investor Water Toolkit provides tools for investors to asses water risks in investment portfolios. In addition, resource efficiency tools are for developing more sustainable water practices in facility level as well as for assessing water risks across the value chain.

Investing in supplier and stakeholder development and capacity-building helps suppliers to start developing and using sustainable solutions.

6.5 Communication and information sharing approaches

Integrated information collection would help corporations to get more consistent data from their suppliers. There are some tools for this available such as EcoVadis and Together for Sustainability initiative (TFS), but these are not specialized in collecting water data. Additionally, TFS is aimed for corporations whose business is about or related to chemical industry.

Corporations should ensure information flow to both directions of a value chain. Usually core corporation receive a lot of information from suppliers, but information does not flow to another direction. However, sharing e.g. best practices learned from one supplier to other suppliers would improve the performance in other location as well. BAT and BEP are useful resources for finding and developing best practices.

Recently improved Water Action Hub by the CEO Water Mandate provides a platform for working together for water sustainability. Corporations working in the same catchment can collaborate to find more sustainable solutions or share information.

6.6 Stakeholder engagement approaches

Open and repeated dialogue on water stewardship issues with suppliers, stakeholders and within corporation is needed for engagement. Dialogue is a softer tool than setting requirements but can be effective, if relationship is stable and trustful.

Collective action with stakeholders at a catchment increases engagement. Collective action includes collaboration with e.g. communities, other businesses and NGOs. Water Action Hub can be used as a platform to find potential partners for collective action. In addition, CEO Water Mandate provides a set of guidelines on how to get started with collective action and stakeholder engagement.

6.7 Example: How to use the toolbox?

An example of how the toolbox could be used when developing a new value chain is presented in Figure 7. The flowchart shows different steps of building a water sustainable value chain and which tools could be used on the way. Firstly, a corporation starts by acknowledging water stewardship at a corporate strategy level. After that, more practical tools can be used for risk assessment and conclusion of a supplier agreement. Lastly, water is part of monitoring, reporting and audits.

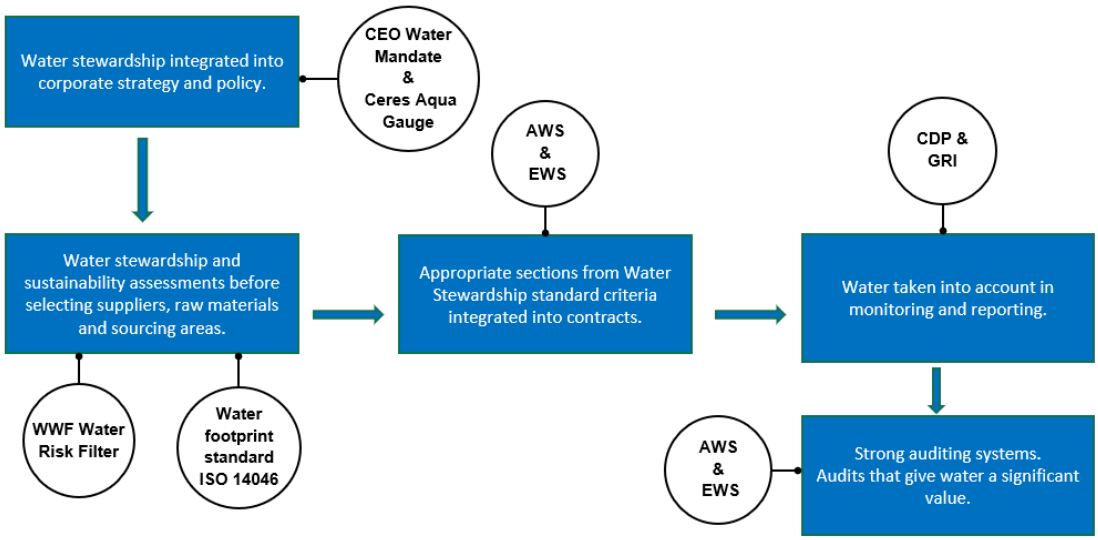

Figure 7. Example for using the toolbox

7 Discussion

Corporations acknowledge water stewardships and consider water as an important resource but in practice it is often only one part of corporate sustainability or responsibility. There are many reasons for this, including lack of knowledge on value chains and on water as a part of production. Because corporations and their value chains are different, also water stewardship has a different role for each corporation. According to interviews, some corporations operate mostly in countries where water availability is not a problem and have short and

clear value chains. In contrast, some corporations have complex value chains and both operations and sourcing happen in water stressed or water scarcity areas. However, water availability or physical water risks are not the only water risks. In addition to physical risks, also reputational and regulatory water risks are important (WWF 2018).

This research focused on Finnish corporations' value chains and how these value chains are managed. There has been discussion on how much corporations should do outsourcing, how to do sourcing sustainably and effectively and how value chains should be constructed (Aydin et al., 2014). This Master's thesis did not suggest any specific changes for value chain construction but tools to manage existing value chains and an example on how to use the tools when creating a new value chain. Changes in value chains such as reducing the number of suppliers were pointed out by few corporate representatives as a possible solution to make value chains easier to manage.

7.1 Discussion on the case study results

The key findings on corporate responsibility and transparency emerging from this thesis are three-fold: they are related to i) contractual relationship, ii) transparency, and iii) certificates. I will next discuss all these three in detail.

When it comes to contractual relationships, ownership of operations and facilities is part of corporate decision-making. Outsourcing is part of global business trends, but it has advantages and weaknesses (Mangan and Lalwani, 2016). It has been criticised how corporations are not familiar with their supply chains and water use of suppliers (Newborne and Dalton, 2016). Many processes of interviewed corporations are outsourced, and corporations have a contractual relationship with their first-tier supplier.

When it comes to transparency, one of the interviewed corporations have some direct suppliers, which helps the corporation to know the journey of a raw material in detailed. A few of the interviewed corporations have own facilities outside Finland. Thus, they have better possibilities to monitor operations in these facilities compared to facilities that are not under their ownership.

As regards to certificates, they are widely used to help corporations to trace the origin of their raw materials and they are widely used as a "proof of responsibility". All the interviewed corporations use some material certificates. Moreover, certificates are also one possibility to show consumers sustainability of products. However, while certificates reflect responsibility, they are mostly focused on specific materials or types of production e.g. forests or organic production. Thus, they do not necessarily consider sustainable use of water. While water responsibility is integrated into sustainability and/or corporate strategy it should not be hidden in under other parts of sustainability. By contrast, water policy should be a guiding tool for decision making (Newborne and Dalton, 2016).

Material certificates have different criteria for water issues. For example, GOTS- certificate includes guidelines for wastewater treatment, collecting data on water resources and consumption per kg of textile output and sanitation and potable water services for employees (GOTS, 2017). Better Cotton Initiative requires producers to promote water stewardship with criteria for sustainable water use, water resource mapping, water quality management

and engaging in collective action (BCI, 2017). Forest certificates such as FSC and PEFC water related criteria is focused on water resource protection and conservation and reducing adverse effects on water (FSC, 2015 & PEFC, 2018).

While there are many different certificates only few of them are related to water, and those few are not yet for consumer information. Naturally, concept of material-specific certificates is different than water stewardship certificates because weight given to water is different. European Water Stewardship standard and Alliance for Water Stewardship International Water Stewardship Standard provide three-level certificates (Bronze, Silver & Gold by EWS and Core, Gold & Platinum by AWS) for corporations. Standards provide wide range of criteria for water stewardship certification. However, these criteria could be used as guidelines or hints for water stewardship strategy and implementation. This standard takes indirect water use and water use embedded in the production into account in extensive way.

One example of using AWS standard comes from electronic corporation Apple. It has collaborated with AWS and Apple suppliers in China received AWS gold certification. Apple provides training and support for their suppliers about improved water recycling and reuse, wastewater treatment and water conservation. Apple has suppliers which are also committed to water stewardship and continue promoting better water management throughout their value chains (Apple, 2019) .

The case studies clearly indicated that corporate water stewardship is usually one part of sustainability work and its' role in larger corporate context is not identified. Details of this issue will be discussed next. Based on the interviews water stewardship is usually part of overall sustainability or responsibility strategy of a corporation or part of business strategy if sustainability is integrated. However, water stewardship is not yet as important for corporations as climate change and emission reduction issues. This was brought up by every corporate representative interviewed. CDP supply chain report 2018 supports this finding. While 53% of member organizations answered to climate questionnaire, water questionnaire received answers from 36% of member organizations (CDP, 2017). Key-informants also mentioned that sustainability is such a large unity that corporates must prioritise. However, corporations could use the same analogy with water stewardship that they have used with climate issues. Corporations have done a lot of work already to be able to calculate carbon footprints of their products and same methods and lessons learned could be used with water stewardship purposes. According to the water stewardship expert interviewed, water stewardship as a part of corporate responsibility is sometimes used too much for marketing purposes and CSR team is more linked to marketing than other sectors of corporation.

Legislation for corporate responsibility is a rising topic in Finland and in the EU. Finnish government is now aiming to enact law on corporate responsibility (Programme of Government 2019). The focus is on human right questions but since water is a human right as well it could be a part of this legislation. Legislation regulating water stewardship in value chains is challenging because value chains include many different countries and legislation may vary between countries. Local or national governments are responsible of allocating water and water permits. Some governments are weak, corrupted or allow too many water permits, which lead to unsustainable water management (Sojamo, 2016). Also, valid water permit does not necessarily mean that corporate work in a sustainable manner e.g. if monitoring the limits of the permits is not done properly. What corporations could do, is to demand stronger governance and water policy.

According to interviews, corporations use ISO14001 environmental standards widely. ISO14046 standard was published in 2014. This standard provides requirements, guidelines and principles for water footprint assessment of processes, products and organizations based on LCA. Whereas corporation use ISO 14001 standards, ISO 14046 is not yet extensively used in corporations. ISO standard family has received criticism due to not specified environmental targets which make comparison between sites difficult, establishing formal structures that do not necessarily improve efficiency or sustainability and not including supply chain and supplier selection (Grant et al. 2017).

Lack of relevant data of value chains is one of the biggest challenges, corporations have with water stewardship. Engaging value chains and watershed management are strongly emphasised in corporate water stewardship. Yet, corporations have hardly any tools to collaborate with other than first-tier suppliers due to contractual relationship with only first-tier suppliers. According to interviews, corporations usually have rather good relations with their biggest suppliers, and they have open dialogues with them. Relationships and information flows are important part of value chain management, and without knowing the whole value chain, a corporation cannot manage water stewardship across it. Relationships and connections between different individuals inside one value chain need to be understood before it is possible to understand how knowledge and information travels (Kano, 2018). If corporations truly want to develop water sustainable value chains, they will collaborate with suppliers to develop advanced solutions.

The size of a corporation as a buyer also has an impact on their relationships. Corporations have more power to request information and wish changes if they are one of the largest buyers of the supplier. Drivers for water stewardship and more generally for sustainability are different for stock-corporations and small and medium size enterprises. For stock-corporations, sustainability is more regulated for instance due to mandatory sustainability reporting and investors have leverage to highlight sustainability or water stewardship (Directive 2014/95/EU). For SMEs sustainability issues are more lead by the corporate's own will.

Many of the interviewed corporations mention in their annual and sustainability reports that they "collaborate", "promote transparency and dialogue" and "engagement" with stakeholders but there is a lack of information how this is done in practices. This can be referred to findings of Newborne and Dalton (2016) that corporations speak about collaborating with stakeholders or engaging stakeholders into their strategies, however it is not always specified who are considered as stakeholders. During the time of "green-washing", corporations should be clear in their external communication and not to hide the challenges under the responsibility phrases.

Traditional value chains are linear while a later concept is a closed-loop value chain that supports circular economy (Sarni & Grant, 2018). Also, in this thesis the traditional model was used. The closed-loop elevates water reuse and recycling emphasising the role water has in circular economy (Sarni & Grant 2018).

7.2 Discussion on the key approaches developed in this thesis

The analytical framework established for this thesis included theories of water stewardship along with value chain and value chain management theories. The framework consisted of

water stewardship context which was combined with the most important concepts of value chain management.

This framework functioned quite well, and it was possible to trace how corporations manage water stewardship in the value chain. Additionally, it was possible to assess the strengths and weaknesses of corporations with this framework and understand which parts are the most challenging. One strength of the framework is that is combines two different frameworks together and provides a novel way to approach corporate water stewardship. With two large frameworks (water stewardship and value chain management) the challenge was to combine these two in a way that maintains the emphasis on water stewardship. They merged quite well, however value chain management aspect could be more clearly defined.

The toolbox developed in this thesis presents six different categories of value chain management, supported by a set of tools in each category. The clear structure of the toolbox should help corporations to utilize it as a whole or by sections. Everything cannot be covered with this one toolbox, but it provides a starting point for corporations to integrate water stewardship as a part of the value chain management. Approaches presented in tje toolbox are not industry-specific, thus all corporations can use them. However, some tools might be more suitable for one industry over another. The toolbox does not explain the order that the tools should be used in a corporate water stewardship journey. This could have been a good addition, but some of the tools should be in continuous use in corporate operations. An example how the toolbox could be used is given in section 6.7.

7.3 Limitations of the study

There are naturally some limitations related to this study, related particularly to time constraints, baseline knowledge of water stewardship and the breadth of the topic. In relation to time constraints, time for each interview was relatively short to cover this complex topic. This was especially the case, if the whole topic was not understood in a similar way. Some of the key-informants did not have much knowledge about water-related issues in their value chain. This was important observations but lack of knowledge limited data collection of water stewardship management within the value chain.

The scope of this study was quite broad and while it provided a good overview of how water stewardship is considered in corporations and their value chains it caused limitations as well. Some of the corporate operations are more important that others regarding water stewardship. This study did not go into specific business areas and due to this e.g. importance of procurement and sourcing strategies for water stewardship were not studied extensively. None of the key-informants worked specifically with procurement. However, relevance of water stewardship for sourcing strategies would be a topic for another master's thesis.

7.4 Future research needs

With this one study it was not possible to find solutions to all the challenges pointed out. One of these challenges relates to trade secrets and to information sharing across the value chain. According to the interviews trade secrets are something that suppliers invoke when refusing to share information. Research on this topic would need prior knowledge on trade laws and what information belongs to this area of legislation.

Another legislation- related topic for future research would be legislation and regulation of contracts; how responsibility and sustainability aims are possible to bind as part of contracts. In addition, interesting research topic would be contracts in one value chain and how water stewardship is considered in contracts with different tier suppliers.

Sourcing decisions and policies are important tools regarding corporate water stewardship. This research did not go to details of sourcing and procurement, but it was acknowledged that sourcing would we important research area.

8 Conclusions

Water stewardship and especially value chain aspect of it is a rather novel approach for corporations. Thus, this study aimed to combine water stewardship and value chain management to provide practical tools for corporations to further develop their water stewardship actions. Research questions in this thesis were:

1) *What are the challenges corporations face regarding water stewardship in their value chains? How do they tackle these challenges?*
2) *How is water stewardship managed across corporate value chains and what kind of tools could be used for the management?*

Analytical framework for this thesis was established by combining water stewardship and value chain management contexts. The analytical framework proved to be suitable for assessing corporations' challenges with water stewardship and what role water stewardship has in value chain management. As expected, corporations are more focused on internal water stewardship actions and external actions are yet quite limited. Clearly, a need for water stewardship tools for especially value chain management existed.

The biggest challenges considered lack of information about value chains and water use in them, difficulties to communicate with suppliers and lack of resources to put on water stewardship since corporations have focused on climate issues. Although, corporations are at the beginning of water stewardship journey all the interviewed corporations have worked on the challenges. Water risk assessments were used in almost all the corporations and value chains of primary materials were known. Yet, there is still a lot to work on.

Water stewardship does not yet have a significant role in value chain management of interviewed corporations. However, corporations are developing methods to integrate water stewardship into their decision-making, including sourcing processes and material selection. One challenge is that corporations have limited possibilities to reach other than first-tier suppliers.

The toolbox established in this thesis include water stewardship tools that are already used in corporate world and some new tools. The idea of a toolbox is to support water stewardship journey of corporations by providing practical answers to challenges that corporations face. With a novel approach of combining corporate water stewardship and value chain management the toolbox provides an offset for corporations to implement water stewardship as part

of the value chain management. Additionally, this thesis has developed the corporate water stewardship concept further.

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HAASTETTELUKYSYMYKSET YRITYKSILLE VESIVASTUUSTA JA VESIVASTUUN HALLINNASTA ARVOKETJUISSA
Diplomityö, Enni Huotari

Vesivastuu yleisesti
Miksi yritys näkee vesivastuun ja veteen liittyvät kysymykset tärkeinä?
Mitä hyötyä yritykselle on/ voisi olla vesivastuusitoumuksesta? Mitä sitoumus vaatii/ vaatisi yritykseltä?
Mikä on yrityksen rooli vastuullisena toimijana?
Miten vesi näkyy osana vastuullisuutta?
Vesivastuu osana yrityksen strategiaa
Pääkysymys: Ovatko vesiasiat integroitu osaksi yrityksen strategiaa?
Tehdäänkö yrityksessä vesiriskien arviointia ja onko se osa yrityksen muuta riskinarviointia? Miten usein riskinarviointi tehdään?
Onko yrityksellä vesivastuustrategiaa? Onko strategia itsenäinen vai linkittyykö se yrityksen strategiaan?
Tarkastellaanko vesiasioita hallitustasolla?
Arvoketjut ja vesivastuu
Pääkysymys: Miten vesivastuu toteutuu yritysten arvoketjuissa ja miten sitä voidaan hallita?
Mikä merkitys vesivastuulla on arvoketjuissa?
Millä perusteilla arvoketjun alihankkijat valitaan? Miten alihankkijoita auditoidaan?
Mikä merkitys alihankkijoiden vastuullisuudella on valinnassa?
Onko yritys tietoinen kaikkien tuotteidensa ja palveluidensa arvoketjujen koostumuksesta?
Miten paljon yritys voi vaikuttaa alihankkijoiden toimintaan ja millä perustein?
Ulottuuko yrityksen arvoketjut maihin, jotka kärsivät vesipulasta? Vaikuttaako tämä yrityksen toimintaan, miten?
Minkälaisia keinoja vesivastuun hallintaan arvoketjuissa käytetään nyt? Minkälaiset keinot ovat/olisivat toimivimpia?
Mikä merkitys vedellä on sertifikaateissa?
Veteen liittyvät tavoitteet, monitorointi ja raportointi.
Onko yritys asettanut veden käytölle tavoitteita Suomessa? Entä arvoketjujen prosesseissa?
Jos yrityksellä on edellä mainittuja tavoitteita, miten niissä on edistytty? Jos ei, minkälaisia tavoitteet voisivat olla?
Miten veden käyttöä (vedenotto, veden kulutus, jätevesien määrä ja laatua) mitataan yrityksen omissa toiminnoissa? Entä arvoketjuissa?
Minkälaisia vesilupia/ ympäristölupia yrityksellä on käytössä?
Onko yrityksen omissa ja kaikissa arvoketjun toimipisteissä työntekijöille tarjolla WASH (water, sanitation and hygiene) -palveluita?
Miten veteen liittyvä informaatio kulkee arvoketjuissa? Onko yrityksen mahdollista saada tietoa veden kulutuksesta arvoketjun eri vaiheissa?
Miten vesiasioista raportoidaan 1) yrityksen sisällä 2) arvoketjuissa 3) julkisesti?
Arvoketjujen osallistaminen
Minkälaiset suhteet yrityksellä on alihankkijoihin?
Keskustellaanko alihankkijoiden kanssa veteen liittyvistä kysymyksistä?
Sitoutetaanko arvoketjuja vesiasioihin ja osaksi yrityksen toimintaan? Jos kyllä, miten? Jos ei, mitä mahdollisuuksia tähän olisi?

Vesivastuusitoumus on vapaaehtoinen. Miten koette vapaaehtoisuuden? Millä keinoin yrityksiä voitaisiin kannustaa vesivastuullisempiin ratkaisuihin?
Mitkä asiat koette haasteellisimmiksi osiksi vesivastuusitoumuksessa ja minkälaista tukea näihin haasteisiin kaipaisitte?